
Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

18 November 2015

Sub-Committee of Experts on the Transport of Dangerous Goods

Forty-eighth session

Geneva, 30 November – 9 December 2015

Item 4 (d) of the provisional agenda

Electric storage systems: miscellaneous

Transport of damaged and defective lithium batteries: comments to the working paper ST/SG/AC.10/C.3/2015/51 from OICA

Transmitted by the European Association for Advanced Rechargeable Batteries (RECHARGE)

Introduction

1. Improvements to the regulation for the transport of damaged and defective batteries under SP376 has been discussed at the TDG Sub-Committee during its 47th session as a result of the Working Paper submitted by PRBA and DGAC (ST/SG/AC.10/C.3/2015/20).
2. Further consideration to this issue was given during the second informal working group meeting on lithium batteries testing requirements held in Washington DC in August 2015 as a result of a proposal made by OICA.
3. Due to the lack of time for an in-depth discussion at the second informal working group meeting, it was suggested to OICA to table its proposal on a modified SP376 at the agenda of the 48th session of the Sub-Committee for further consideration. The proposal from OICA is contained in the Working Paper ST/SG/AC.10/C.3/2015/51.
4. RECHARGE is supporting the initiative taken by OICA and its objectives suggesting to discuss the possibility and the need of defining packing requirements for the transport of potentially hazardous damaged or defect batteries (in reference to the last § of SP376) that currently can only be transported after being granted an approval by a competent authority on an individual basis.
5. The objective of OICA is to define packing instructions and technical criteria that will allow the transport of potentially hazardous damaged and defective batteries (HD&DB) without asking for an authorization from a Competent Authority on a case per case basis.
6. Such approvals delivered on an individual basis can be found at the following web address:

http://www.unece.org/trans/danger/publi/adr/country-info_e.html
7. RECHARGE comments supplied in the attached ANNEX to this Informal document are bringing complementary elements to OICA's proposal considering a wider range of batteries and additional intervention means before the transport of these batteries, in particular, the possibility of de-activation of the HD&DB.

8. RECHARGE comments are supplied as complementary information to the technical discussion that should preferably be held during the 3rd IWG to be organized in Bordeaux (France) from March 29th till March 31st 2015, pending the opinion of the Sub-Committee.

ANNEX

COMMENTS TO THE WORKING PAPER
PREPARED BY OICA ST/SG/AC.10/C.3/2015/51 (UN SUBCOMMITTEE 48TH SESSION - December 2015)

1. OBJECTIVE
2. CHARACTERISTICS OF THE BATTERY UNDER CONSIDERATION
3. PREVENTIVE BATTERY RELATED CRITERIA (for Transport)
4. PACKAGING RELATED CRITERIA
5. CRITERIA TO BE CONSIDERED FOR A SIMULATED ANALYSIS
6. PRACTICAL TEST CRITERIA
7. CRITERIA LINKED TO THE TESTS REPORT

	RECHARGE suggestions to OICA Proposal (In red and bold in the text)	COMMENTS
1.	OBJECTIVE.	
	<p>NB. Maintain Introductory Note of OICA §1 to §4.</p> <p>Objective. Develop Tests and Packaging Criteria (as well as tests certification data) that will allow the transport of hazardous damaged and defective batteries without authorization from a CA when applied (Reference to last § of SP376).</p> <p>OICA § 5.</p> <p>5. OICA proposes to discuss the possibility and the need of defining standards to packaging and testing regarding the transport of such potentially risky damaged/defect batteries as a way to avoid competent authority approvals. In many cases that could be covered by already existing solutions based on granted competent authority approvals.</p>	

2.	<p>CHARACTERISTICS OF THE BATTERY UNDER CONSIDERATION</p> <p>OICA § 6 . The following scenarios must be considered, if applicable:</p> <p>These provisions apply to batteries subject to or showing the following properties:</p> <ul style="list-style-type: none"> (i) Rapid disassemble, (ii) Dangerous reaction, (iii) Produce of a flame, (iv) Dangerous evolution of heat, or (v) Dangerous emission of acute toxic, corrosive or flammable gases or vapors. <p>Damaged and Defective Batteries that have started to react are not allowed for transport.</p> <p>The transport of hazardous damaged and defective batteries should be segregated from the transport of other goods (dangerous or not).</p>	
3.	<p>PREVENTIVE BATTERY RELATED CRITERIA (before Transport)</p> <p>OICA § 6.</p> <ul style="list-style-type: none"> (a) All terminals of lithium cells and batteries shall be protected against external short circuit. (b) All openings for service fluids other than for electrolyte shall be closed. (c) Residues of dangerous goods as well as of the electrolyte on the surface of the outer casing of Lithium cells and batteries shall be removed, as appropriate. <p>(x new) The deactivation of batteries may be considered as an alternative preventive measure before transport. In this case, such de-activated damaged and defective batteries will be transported under SP376 and P908 or LP904.</p>	<p>For Liquid Cooled Batteries draining the cooling liquid may be an appropriate measure.</p> <p>P908 requires already the use of absorbent material. Removing chemicals on site (by a non-expert) may be hazardous. There should be an alternative to the requirements of item (c).</p>

4.1.	<p>PACKAGING RELATED CRITERIA</p> <p>OICA § 6.</p> <p>(d) Packaging shall conform to the packing group I performance level.</p> <p>(e) The packaging must be capable to withstand the potential heat release and fire development risk scenarios related to the type of Lithium-cell/-battery at maximum the energy content where it will be transported or otherwise agreed.</p>	
4.2.	<p>PACKAGING RELATED CRITERIA</p> <p>The following parameters points must be respected during the test performance or considered by the simulation analysis. guaranteed successfully during these scenarios:</p> <p>(i) The temperature on the outside of the packaging may not exceed 100°C during the reaction,</p> <p>(ii) Gases or vapours escaping the packaging may not be flammable or acutely toxic. If an escape of flammable or acute toxic gases or vapors cannot be prevented by the construction of the packaging, the composed gas must be:</p> <ul style="list-style-type: none"> • Directly treated or • A change of sufficient air in the load compartment of the cargo transport unit must be guaranteed, so that the flammable or acute toxic gases or vapors outside the packaging developed by venting the Lithium cells and batteries are not inflammable, flammable or dangerous or • The developed gases or vapors can be purged out of the load compartment without danger. <p>(iii) A damage or explosion of the packaging through developed overpressure must be prevented, e.g. per structural arrangements (such as a vent or calibrated loose lids...).</p> <p>(iv new) An alternative or complementary approach would consist in the definition of technical parameters that needs to be fulfilled by the packaging.</p> <p>It will require to develop a list of criteria for the packaging, such as:</p> <p>Materials to be used: steel, aluminium, non-combustible materials, etc...as packaging materials</p> <p>Technical parameters to be observed in case of reaction of the battery:</p> <p>-Heat resistance till XXX°C</p>	<p>The temperature limit [100°C] should be determined based on the hazard that is foreseen.</p> <p>The basis for a temperature limit should be correlated to the prevention of the risk for propagation of heat to neighbour packaging....</p>

	<p>-Thermal conductivity properties till X°/sec. -Pressure release / controlled until XX kP. -Etc...</p>	
4.3.	<p>8. If a packaging has already been successfully proven capable (e.g. by testing as specified in (4), (5) and (6) or calculation as in (9)) with a lithium-cell-/battery-type at maximum energy content, this packaging can be used for the transport of other lithium-cells/-batteries under certain conditions. The conditions are that these lithium-cells/-batteries correspond to the successfully tested lithium-cell-/battery-type regarding construction and cell-/battery-chemistry, as well as that these have an identical or lower energy content.</p> <p>§ 8 requirements should apply under certain conditions, such as:</p> <ul style="list-style-type: none"> • The type of battery should include a range of identical/equivalent electrochemical system. • The total energy embarked should not be higher than the tested/modelled battery. • In case of smaller batteries installed in larger equipment, the use of cushioning materials shall be considered. <p>Note. When the fire is extinguished by the packaging ancillary equipment, the maximum energy content will not be released during the test.</p>	
4.4.	<p>9. The capability of the packaging can either be demonstrated physically during a test with a lithium cell/battery in the respective packaging or alternatively proven by simulated analysis associated with an appropriate packing design.</p>	
5.	<p>CRITERIA TO BE CONSIDERED FOR A SIMULATED ANALYSIS</p>	
	<p>The following parameters should be considered as a minimum requirement for the simulated analysis, if applicable:</p> <p>(a) 100% SOC for all lithium cells/batteries inside packaging or a SOC representative of the energy content of the battery as transported,</p> <p>(b) Mass and dimension of the lithium cells/batteries,</p> <p>(c) Determine available air inside of packaging (oxygen for reaction and heat transfer),</p> <p>(d) All material properties: Density [$\text{kg}\cdot\text{m}^{-3}$], specific heat capacity [$\text{J}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$], heating value [$\text{KJ}\cdot\text{kg}^{-1}$], thermal conductivity [$\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$], melting temperature and flammability temperature [K], heat transfer coefficient of the outer packaging [$\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$], ambient air temperature 25°C,</p>	<p>The list of criteria should be reviewed and only appropriate data should be indicated.</p> <p>Existing scientific information on the heat release rate in case of thermal runaway should be used.</p>

	<p>(e) Determine energy released with potential chemical reaction per element based on available elements for reaction (e.g. oxygen) for lithium cell/battery and packaging,</p> <p>(f) Electrical energy to be discharged by a single event</p> <p>(i) Consider worst failure modes based on knowledge on cell(s), module(s) and total battery design,</p> <p>(ii) Total energy conversion within 30 minutes,</p> <p>(iii) Worst case scenario to be analyzed for 24 hours.</p>	
6.	PRACTICAL TEST CRITERIA	
	These criteria shall be defined during the 3rd Informal Working Group Meeting.	
7.	CRITERIA LINKED TO THE TESTS CERTIFICATE	
	<p>7. The test results shall be documented and the technical documentation shall include at least the following information:</p> <p>(a) A number of tested lithium cell(s)/battery(ies),</p> <p>(b) Weight of the tested lithium cell(s)/battery(ies),</p> <p>(c) Dimensions of the tested lithium cell(s)/battery(ies),</p> <p>Type of lithium cell(s)/battery(ies) or chemistry of the tested lithium cell(s)/battery(ies),</p> <p>e) Energy content of the tested lithium cell(s)/battery(ies).</p> <p>On request the technical documentation must be submitted to the competent authority.</p> <p>Additional criteria may be defined during the discussion at the 3rd IWG in accordance with the Tests Report under preparation.</p>	